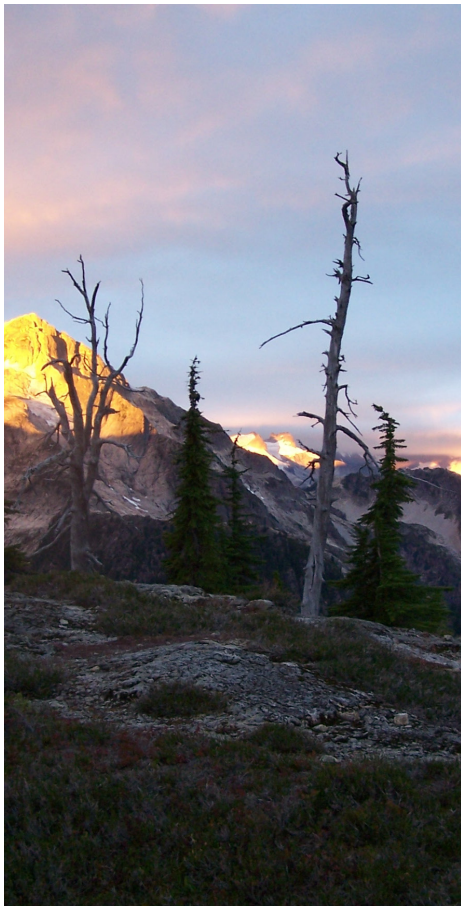
North Cascades Resource Brief

National Park Service
U.S. Department of the Interior

North Cascades
National Park Complex



TOP: Standing dead and standing live whitebark pine in the upper subalpine BOTTOM: Close up of whitebark pine bough.

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Whitebark Pine

Whitebark pine (*Pinus albicaulis*) is a keystone species in high-elevation ecosystems of Western North America. It is often the first tree species to establish in subalpine meadows or on alpine ridges. Once present on a site, whitebark pine influences snowmelt patterns, soil development, and provides important micro-sites for the establishment of other subalpine plant species.

Whitebark pine seeds are a valuable food source for birds, squirrels, and bears. Clark's nutcrackers (*Nucifraga columbiana*), red squirrels (*Tamiasciurus hudsonicus*) and Douglas squirrels (*Tamiasciurus douglasii*) extract seeds from the closed cones and then cache them in subalpine meadows for future retrieval.

The non-native white pine blister rust and native Mountain pine beetles threaten the long-term survival of whitebark pine populations in the Pacific Northwest.

Status

Whitebark pine grows on cold, dry sites generally above 5,000' (1524 m). In Olympic National Park, whitebark pine is limited to three populations east of Mount Olympus, and trees are often found in a clumped formation where individuals are difficult to distinguish. In North Cascades and Mount Rainier national parks, whitebark pines are generally distinct individuals in the subalpine zone or krummholz (short, shrubby growth form) near treeline. They occur predominately on the east side of North Cascades National Park and the northeast corner of Mount Rainier National Park, although smaller disjunct populations are found on the west side of both parks.

Today, white pine blister rust (*Cronartium ribicola*) and mountain pine beetles (*Dendroctonus ponderosae*) threaten the long-term survival of whitebark pine. Blister rust is an Eurasian fungus that was introduced to North America in 1910. Surveys have documented blister rust in all stands within the three national parks. Extensive surveys in Mount Rainier and North Cascades national parks (1994-1999) found that 31% of trees were dead, 22% of trees were infected, and 47% of trees showed no signs of infection. Surveys of saplings (< 2.54 cm DBH, diameter at breast height) documented similar rates of infection and mortality. Generally, the percentage of infected trees increased from west to east and with increasing elevation. Mortality rates decreased with elevation which may be a result of shorter growing seasons at higher elevations and a longer time period for the infection to spread within the tree.

Long-term monitoring of whitebark pine was initiated in Mount Rainier and North Cascades national parks in 2004. Whitebark pines were tagged within permanent plots allowing park scientists to document changes in tree growth, rates of blister rust infection, mortality, and presence of mountain pine beetles.

Discussion

Evaluation of long-term plots in 2009 revealed disappointing trends in mortality and infection rates. At Mount Rainier, the proportion of uninfected trees (>2.54 cm, DBH) decreased from 37% to 22% while infections rates rose from 15% to 26% and mortality increased from 48% to 52%. In North Cascades, the proportion of uninfected trees decreased from 54% to 32% and infection rates increased from 29% to 39% while mortality increased from 17% to 29%. Infection rates in saplings (individuals taller than 50 cm but <2.54 cm dbh) increased in both parks (25% to 43% in MORA and 17% to 21% in NOCA), although live sapling density remained stable. Incidence of mountain pine beetle was fairly low in each park (3% of sites in NOCA and < 1% of sites in MORA).

Research is also being conducted to determine patterns of genetic diversity, genetic resistance to blister rust, and methods to restore whitebark pine populations. In 2007, initial results of the genetic resistance screening indicated that seedlings grown from Mount Rainier parent trees have the highest levels of rust resistance of any seed source in the Pacific Northwest, as tested by the U.S. Forest Service. Results of research and monitoring will be utilized to develop site specific restoration strategies.